with the general distribution of population by nationalities. One item gathered from the reports, but not shown by this table, is that only 15 of these cases were colored people, and the mortality among them was 2. As to sex, 100 cases were females. So far as occupation was concerned all walks of life were represented, but the greater number of cases occurred among those engaged in occupations apparently requiring physical rather than intellectual effort.

TABLE 4.—*The 841 cases of sunstroke reported from hospitals or private practice, arranged according to nativity and fatality*

Nativity.	Number reported.	Deaths.	Nativity.	Number reported.	Deaths.
United States	340	37	Austria	5	2
Ireland	253	44	Denmark	2	1
Germany	123	24	Belgium	1	1
England	32	5	South America	2	0
Italy	14	0	Spain	1	0
France	10	5	Holland	1	1
Canada	8	3	Australia	1	0
Norway and Sweden	10	5	Armenia	1	0
Russia	7	0	Greece	1	0
Poland	6	0	Unknown	15	12
Scotland	5	0			
Switzerland	3	0	Total	841	140

HOW THE CHINOOK CAME IN 1896.

By A. B. COE, Voluntary Observer (dated Kipp, Mont., December 10, 1896).

Picture to yourself a wild waste of snow, wind beaten and blizzard furrowed until the vast expanse resembles a billowy white sea. The frigid air, blowing half a gale, is filled with needle-like snow and ice crystals which sting the flesh like the bites of poisonous insects, and sift through the finest crevices. The sun, low down in the southern horizon, looks like a frozen globe, with halves, crescents, and bright prismatic bars encircling it.

Great herds of range cattle, which roam at will and thrive on the nutritious grasses indigenous to the northern Slope, wander aimlessly here and there, or more frequently drift with the wind in vain attempts to find food and shelter; moaning in distress from cold and hunger, their noses hung with bloody icicles, their legs galled and bleeding from breaking the hard snow crust as they travel—they appeal to the hardest heart for pity. It is sure death for human beings to be caught out in one of these awful blizzards, with the temperature down to 30° or 50° below zero, unless rescue is speedy. Yet, such conditions frequently exist in this latitude, as they did for fifteen days in November, 1896, when it seemed as if the elements had conspired to bring about another ice age, and annihilate every living thing.

Would the "chinook" never come? The wind veered and backed, now howling as if in derision, and anon becoming calm, as if in contemplation of the desolation on the face of nature, while the poor dumb animals continued their ceaseless tramp, crying with pain and starvation. At last, on December 1, at about the hour of sunset, there was a change which experienced plainsmen interpreted as favorable to the coming of the warm southwest wind. At sunset the temperature was only —13°, the air scarcely in motion, but occasionally seemed to descend from overhead. Over the mountains in the southwest a great bank of black clouds hung, dark and awesome, whose wide expanse was unbroken by line or break; only at the upper edge, the curled and serrated cloud, blown into tatters by wind, was seen to be the advance courier of the long-prayed for "chinook." How eagerly we watched its approach! How we strained our hearing for the first welcome sigh of the gentle breath! But it was not until 11.35 p. m. that the first influence was felt. First, a puff of heat, summer-like in comparison with what had existed for two weeks, and we run to our instrument shelter to observe the temperature. Up goes the mercury, 34° in seven minutes. Now the wind has come with a 25-mile velocity. Now the cattle stop traveling, and with muzzles turned toward the wind, low with satisfaction. Weary with two weeks standing on their feet they lie down in the snow, for they know that their salvation has come; that now their bodies will not freeze to the ground.

The wind increases in strength and warmth; it blows now in one steady roar; the temperature has risen to 38°, the great expanse of snow 30 inches deep on a level is becoming damp and honeycombed by the hot wind, and we retire satisfied that the "chinook" is a genuine and lasting one.

Twelve hours afterward there are bare brown, hills everywhere; the plains are covered with floods of water. In a few days the wind will evaporate the moisture, and the roads will be dry and hard. Were it not for the "chinook" winds the northern Slope country would not be habitable, nor could domestic animals survive the winters.

A METHOD OF FILLING A BAROMETER.

By Prof. EDWARD A. PARTRIDGE, Central Manual Training School, Philadelphia (dated November 12, 1896).

The tube selected for the barometer must be cleaned with the utmost care. This can be effected conveniently before sealing, as follows: After soaking for two hours in nitric acid, the tube is washed thoroughly with water. Then a wire drawing a string after it is passed into the tube. In the middle portion of the string there is a loop carrying a wad of cotton of suitable size. By drawing the string back and forth the cotton is made to wipe off all dirt. The tube is then washed with water, treated for a few minutes with a strong solution of caustic alkali, followed by thorough washing with pure water. A wad of cotton filled with precipitated chalk is next drawn through the tube. The precipitated chalk is preferable to rotten stone, tripoli, emery flour, or similar materials, since it can be entirely removed by subsequent treatment with nitric acid and water. This polishing of the tube is important, as it tends to give a clean surface, which allows the column of mercury to move with freedom in the tube. After the last treatment with nitric acid and subsequent careful washing with distilled water, the tube is set on end to drain, then carefully dried by drawing air (previously passed through sulphuric acid), through it, and at the same time heating it. After sealing the end the tube is arranged as shown in Fig. 1.

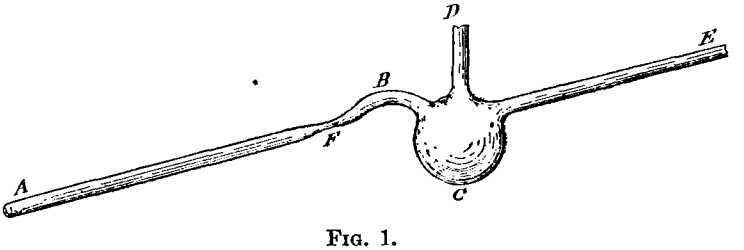

FIG. 1.

A B is the barometer tube, inclined at an angle of about 15°. The inclination should not be made more than 15°, since if it is the mercury acquires considerable velocity in sliding down the tube and will fall into the mercury already there with a splash, thus entangling a very minute portion of air. With the inclination of 15° there is no such splashing. *C* is a light glass retort which can be made by any one moderately skillful at glass blowing. *D* is a tube for introducing the proper amount of mercury to fill *A B*. *E* is a tube hermetically sealed to a mercury air pump, preferably of the Geissler type. *E* should be at least 10 inches long and inclined downward toward the retort in order that the mercury vapor may condense in it and run back to *C* instead of going to the pump. After introducing the mercury the tube *D* is heated with the blowpipe and drawn off and sealed. Between

the connecting tube *E* and the pump a bulb containing phosphoric anhydride must be placed. The whole apparatus, suitably supported, is now completely exhausted by running the pump continuously for hours, occasionally heating the tube *A B* with the flame of a Bunsen burner. *C* should also be heated until mercury vapor is somewhat freely given off to drive out moisture and air. By this method all moisture in the mercury, together with the film of air which obstinately adheres to the inside of the tube, can be as nearly as possible removed. When this has been accomplished, the retort *C* is carefully heated to distill the mercury over into *A B*, where the mercury condenses in small globules, which do not form pistons in the tube, and which run down the lower side of *A B*, thereby displacing any residual air. The distillation is continued until *A B* is filled; the pump is kept in action all the time. By the continuous action of the pump the vacuum is kept as complete as possible during the entire operation. The tube *E* is then cut from the pump to let air into the retort. The barometer tube is cut off at *F* and immersed in mercury with the usual precautions. Tubes that we have filled by this method show not the slightest trace of air when inclined.

The essential feature of the method consists in distilling the mercury into an inclined tube of such an internal diameter that the mercury collects in globules, which run down the lower side of the tube, instead of forming pistons, which would imprison and carry down the residual air, thus rendering the vacuum imperfect. Tubes of internal diameter greater than one-eighth inch are large enough to be filled in this manner. If the bore is less than one-eighth of an inch, the mercury will form pistons and carry down the residual air.

The method is the result of experiments carried out by my father, Mr. D. A. Partridge, and myself.

At first sight the above method seems almost completely identical with that described by Waldo in the American Journal of Science, 1884, Vol. XXVII, p. 18. I do not believe, however, that a good instrument could be made by Waldo's method, since the mercury, when distilled into his vertical tube, would form pistons and carry down air. He says that watch must be kept to see that no air is carried down. I have tried his method with a mercury pump, giving far better vacua than pumps of the form then in use could give, and have always found minute air bubbles entangled in the mercury. I therefore think that my method, if not wholly new, is really an important one and a real advance. Another important difference between my method and that of Waldo is that I keep the pump working during the entire distillation, and he stops his before commencing.

[Further details as to filling large tubes that are to be used for either barometers or manometers will be found in Professor Marvin's articles on vapor pressure and on a normal barometer in the Annual Report of the Chief Signal Officer for 1891, Appendix 10. The admirable barometer of Sundell (*Acta Societatis Scientiarum Fenicæ*, Vols. XV and XVI, Helsingfors, 1885 and 1888) is fully described in Waldo's Modern Meteorology, London and New York, 1893, to which we would refer our readers for many other details as to the advanced state of physical apparatus and mechanical theories that constitute modern meteorology.—ED.]

THE COLD SPELL OF NOVEMBER 16-30, 1896, IN MONTANA AND ADJOINING STATES.

By PROF. H. A. HAZEN (dated December 21, 1896)).

A remarkable depression in temperature occurred in the Northwestern States during the last two weeks of November. At Havre, Mont., the culmination was on the 18th, p. m., with a temperature of 54° below normal, though on the 29th, p. m., it was —51°. Not the least singular fact in this connection is the abnormal warmth in the Middle Atlantic States, where for a considerable area the temperature during the same time was 10° above normal. Charts VIII and IX of this REVIEW show the average departure from the normal for each day of these two weeks. A very good idea of the extent and severity of this cold spell may be obtained by comparing it with the coldest November experienced in the past twenty-seven years, that of 1880, as follows:

Stations.	Departure from normal.	
	1880.	1896.
	°	°
Havre, Mont	— 9	—27
Helena, Mont	—11	—15
Miles City, Mont	— 8	—19
Williston, N. Dak	— 7	—22
Bismarck, N. Dak	— 9	—20
Rapid City, S. Dak	—12	—16
Pierre, S. Dak	— 8	—20

The limited extent of the present cold spell may be shown by a comparison with a few stations on its border: Salt Lake City, 1880, —9°, 1896, —2°; Kansas City (Leavenworth), —8° and —3°; Columbia, Mo., 1896, + 2°; Alpena, Mich., —7° and + 2°; Amarillo, Tex. (Fort Elliott), —12 and —3°. Another point to be noted is that while the extreme cold of 1880 extended over the whole country, for example, Vicksburg, —8°, Atlanta, —4°, Charlotte, —5°, Washington, —4°, and Eastport —2°, that of 1896 was limited to a few States in the Northwest, whereas in the Middle Atlantic States, November, 1896, was the warmest since 1870, and at Philadelphia it was the warmest in seventy-five years (records before 1870 a little doubtful, stations in the city differing 2° or 3° in the same month).

A study of the weather conditions accompanying such marked anomalies in temperature would be of interest in helping to explain them. As already noted there was a permanent area of high pressure over the Northwest during this period, departure from normal + .50 inch at Havre and + .43 inch at Bismarck. This could not have been due to a too great reduction to sea level because of the low temperature, for Bismarck is only 1,690 feet above sea level, and the change for temperature is small at that height.

This distribution of pressure produced northwesterly and westerly winds in the Missouri and upper Mississippi valleys, but in the middle and lower Mississippi valleys to the Atlantic the winds were southeasterly, southerly, and southwesterly. On the south Atlantic Coast, northeasterly winds from the ocean tended to keep the temperature up. Comparing the pressure distribution with that of 1880, we find in the latter year high pressures over the whole country, and in consequence the winds mostly north and northwest, except in a portion of the lower Lake Region, where they tend toward southwest. It is evident that the winds will account for a part of the anomalous conditions in these two years but not for all.

Turning now to the daily weather maps we find in 1880 a succession of highs appearing to the north of Montana and traveling clear across the country, producing distinctive cool or cold waves due to the advance of the high. In 1896, on the other hand, there were almost no highs advancing across the country, and there were hardly any cool waves. This was particularly the case in the Northwestern States. This seems a key to the whole situation. Almost stagnant high areas in the Atlantic States and in the Northwest produced the abnormally high pressure in 1896, while the uniform motion of highs in November, 1880, produced the uniform high pressure over the country.

It remains to inquire why the stagnant high areas in the Northwest gave such low temperatures, while apparently, the